

Application No. 10/765,252
Paper Dated October 28, 2005
In Reply to USPTO Office Action Dated August 31, 2005
Confirmation No. 9565
PPG Docket No. 1909A1

Initially, Applicant thanks the Examiner for the time and consideration afforded during a telephone call with Applicant's undersigned representative on September 21, 2005. During the telephone call, the Examiner indicated a willingness to reconsider the Applicant's position, and the present communication is submitted in response thereto.

Claims 1-6 and 8-9 stand rejected under 35 U.S.C. §102(b) as allegedly anticipated by U.S. Patent No. 5,563,233 to Reich et al. (hereinafter "Reich"), and claims 7 and 10-23 stand rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Reich. Each of these rejections is respectfully traversed.

Generally speaking, the claimed invention is directed to unsymmetrical urethane polyol precursors, which are intended for use as a component in reaction with a polyisocyanate in a later reaction scheme to form, for example, coating compositions. More particularly, the claimed invention represents a trimeric unsymmetrical polyol which is a reaction product of a diisocyanate with two different diols, namely, a short chain aliphatic diol and a longer chain polymeric diol with an oxycarbonyl linkage. The reaction is controlled so as to produce a polyol as the reaction product, including hydroxyl termination. Such a polyol with hydroxyl termination is a precursor or an intermediate product. For example, the thus formed polyol precursor may be later reacted with a polyisocyanate to form a polyurethane coating composition. Reich, however, fails to teach or suggest the formation of such a polyol, and instead is directed to a conventional polyurethane polymer gel, not a precursor or intermediate product.

For example, Reich teaches conventional polyurethane polymerization in which a urethane polymer gel is formed by reacting a diisocyanate with one or

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more diols in the presence of water to form a fully cured polyurethane polymer gel, not a polyol as a precursor for a further polyurethane polymerization reaction. The use of water in the reaction scheme of Reich with a diisocyanate and diol suggests complete polymerization of the polyurethane. In fact, the overall invention in Reich involves a critical selection of the amount of water in the reaction mixture. In this manner, the reaction product formed by reacting the isocyanate and the diols is a fully cured polyurethane polymer, with all of the reactive groups being reacted and no hydroxyl groups remaining on the thus formed reaction product.

On the other hand, all of the independent claims of the present invention specifically recite a polyurethane polyol which includes hydroxyl termination. While the polyol precursor of the present claims represents the reaction product of a diisocyanate with two distinct diols, the reaction is controlled so as to produce a hydroxyl-terminated polyol as the reaction product, and NOT a fully reacted polyurethane polymer in which all of the reactive groups have been fully reacted as disclosed in Reich.

The final Office Action alleges that "since the [Reich] reference uses the same chemical components in the same ratios, the reaction product of the reference would inherently be the same, i.e. it would have hydroxyl termination as presently claimed." The Action further notes in response to Applicant's prior arguments that "Reich discloses a reaction product comprising a mixture of the same diol component and organic diisocyanate as presently claimed. Thus, the reference teaches the same product as claimed." Such a conclusion, however, is not based on a complete understanding of the reaction schemes. Since Reich involves a reaction scheme involving polymerization of an isocyanate and one or more diols in the presence of water (or amine), it necessarily involves polyurethane polymerization including reaction of all functional groups such as

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hydroxyl groups of both ends of the diols. In fact, the intent of Reich is to select a critical amount of water to achieve the intended polymerization such that the reaction product forms a polyurethane polymer in the form of a tough gel with complete reaction of the diols. The allegation in the Office Action that Reich inherently produces a reaction product as a polyol having hydroxyl termination, as required by the present claims, is entirely contrary to the intent of the teachings of Reich, which is to react the functional groups to produce a polymer as a tough gel, not to produce a precursor including hydroxyl functional groups for later reaction.

In the present invention, the reaction product of the claims includes hydroxyl termination since the reaction scheme produces a polyol as a precursor or intermediate product. This is accomplished by reacting the diisocyanate with a stoichiometric excess of a short chain aliphatic diol having 1-6 carbons and a longer chain polymeric diol with 5-20 carbons and having an oxycarbonyl linkage under anhydrous conditions, as discussed at paragraph [0018] and in the examples of the specification. Accordingly, the product of such a reaction is a trimeric urethane polyol as a prepolymer, which includes terminal hydroxyl groups linked through a urethane linkage. Such a product with reactive functional groups is entirely different than the polyurethane polymer gel produced in Reich. Simply speaking, Reich teaches formation of a polyurethane polymer, whereas the present invention defines a polyol prepolymer, which may further be used as a precursor in a subsequent reaction to form a polyurethane polymer.

Moreover, in the present invention, the polyol is formed by reacting a diisocyanate with two different diols of different chain length, thereby producing a urethane polyol which is unsymmetrical, including a short chain moiety having hydroxy functionality at one end and a long chain moiety having hydroxy functionality at the other end. The reaction is controlled so as to react the

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hydroxyl group at one end of the short chain diol with one of the isocyanate groups of the diisocyanate while leaving the hydroxyl group at the other end of the short chain diol unreacted, and to react the hydroxyl group at one end of the long chain polymeric diol with the other isocyanate group of the diisocyanate while leaving the hydroxyl group at the other end of the long chain polymeric diol unreacted. In this manner, a trimeric polyol is formed with the short and long chain moieties linked together through urethane linkages (derived from the diisocyanate), and with terminal hydroxyl groups extending from either end of the polyol. In this manner, the reaction product represents a trimeric unsymmetrical polyol. Reich fails in any way to teach or disclose a reaction to form such an unsymmetrical polyol, which includes terminal hydroxyl groups. In fact, there is nothing in Reich which teaches, discloses or even remotely suggests the formation of a trimeric urethane polyol having a short chain hydroxyl termination at one end and a long chain hydroxyl termination at the other end based on the reaction of a diisocyanate with an aliphatic diol and a polymeric diol. Instead, the goal of Reich is to react all of the reactive groups, i.e. the hydroxyl groups of the diols, so as to form a polymer, not a polyol.

Further, the trimeric urethane polyol "prepolymer" of the present invention including terminal hydroxyl groups is particularly useful as a first component in a two-component coating composition in combination with a further polyisocyanate. As such, the terminal hydroxyl groups of the polyol are capable of reacting and polymerizing with a separate polyisocyanate in a separate reaction, thus forming a polyurethane polymer as a coating composition having a low viscosity and high solids content. There is nothing in Reich which would lead one skilled in the art to react a diisocyanate with an aliphatic diol and a polymeric diol having an oxycarbonyl linkage to form a polyol with hydroxy termination, or to thereafter react such a polyol with a polyisocyanate to form a coating composition with low viscosity and high solids content. In fact, such properties are entirely contrary to

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the polyurethane polymer formed in Reich, whose intent is to produce a composition in the form of a tough gel having a high viscosity.

It is apparent from the above remarks that Reich fails to teach, disclose or suggest the polyurethane polyol of the present invention comprising the hydroxyl-terminated reaction product of a diisocyanate with an aliphatic diol and a polymeric diol as claimed, let alone a coating composition as the further reaction product of such a polyol with a polyisocyanate. Accordingly, the rejections based on Reich should be withdrawn.

Based on the foregoing, Applicant submits that the claims are allowable over the prior art. Applicant therefore respectfully requests that the Examiner reconsider the rejections of the claims and withdraw the rejections. Should the Examiner wish to discuss any of these issues in further detail, the Examiner is invited to contact Applicant's undersigned representative by telephone at 412-471-8815.

Respectfully submitted,

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